STS10OP.STS

OPERABLE/OPERABILITY:
ENSURING THE FUNCTIONAL CAPABILITY OF A SYSTEM OR COMPONENT

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1.0 PURPOSE AND SCOPE

To provide guidance to NRC inspectors for the review of licensee operability determinations affecting the following systems, structures, or components (SSCs):

(i) Safety-related SSCs, which are those relied upon to remain functional during and following design basis events (A) to ensure the integrity of the reactor coolant pressure boundary, (B) to ensure the capability to shut down the reactor and maintain it in a safe shutdown condition, or (C) to ensure the capability to prevent or mitigate the consequences of accidents that could result in potential offsite consequences comparable to the 10 CFR Part 100 guidelines. Design basis events are defined the same as in 10 CFR 50.49(b)(1).

(ii) All SSCs whose failure could prevent satisfactory accomplishment of any of the required functions identified in (i) A, B, and C.

(iii) All SSCs relied on in the safety analyses or plant evaluations that are a part of the plant's current licensing basis. Such analyses and evaluations include those submitted to support license amendment requests, exemption requests, or relief requests, and those submitted to demonstrate compliance with the Commission's regulations such as fire protection (10 CFR 50.48), environmental qualification (10 CFR 50.49), pressurized thermal shock (10 CFR 50.61), anticipated transients without scram (10 CFR 50.62), and station blackout (10 CFR 50.63).

(iv) Any SSCs subject to 10 CFR Part 50, Appendix B.

(v) Any SSCs subject to 10 CFR Part 50, Appendix A, Criterion 1.

(vi) Any SSCs explicitly subject to facility Technical Specifications (TS).

(vii) Any SSCs subject to facility TS through the definition of operability (i.e., support SSCs outside TS).

(viii) Any SSCs described in the FSAR.

This guidance is directed toward NRC inspectors that are reviewing actions of licensees that hold an operating license. Although this guidance generally reflects existing staff practices, application on specific plants may constitute a backfit. Consequently,

significant differences in licensee practices should be discussed with NRC management to ensure that the guidance is applied in a reasonable and consistent manner for all licensees.

2.0 DEFINITIONS:

2.1 Current Licensing Basis

Current licensing basis (CLB) is the set of NRC requirements applicable to a specific plant, and a licensee's written commitments for assuring compliance with and operation within applicable NRC requirements and the plant-specific design basis (including all modifications and additions to such commitments over the life of the license) that are docketed and in effect. The CLB includes the NRC regulations contained in 10 CFR Parts 2, 19, 20, 21, 30, 40, 50, 51, 55, 72, 73, 100 and appendices thereto; orders; license conditions; exemptions, and Technical Specifications (TS). It also includes the plant-specific design basis information defined in 10 CFR 50.2 as documented in the most recent Final Safety Analysis Report (FSAR) as required by 10 CFR 50.71 and the licensee's commitments remaining in effect that were made in docketed licensing correspondence such as licensee responses to NRC bulletins, generic letters, and enforcement actions, as well as licensee commitments documented in NRC safety evaluations or licensee event reports.

2.2 Design Basis

Design basis is that body of plant-specific design bases information defined by 10 CFR 50.2.

2.3 Degraded Condition

A condition of an SSC in which there has been any loss of quality or functional capability.

2.4 Nonconforming Condition

A condition of an SSC in which there is failure to meet requirements or licensee commitments. Some examples of nonconforming conditions include the following:

1. There is failure to conform to one or more applicable codes or standards specified in the FSAR.

2. As-built equipment, or as-modified equipment, does not meet FSAR design requirements.

3. Operating experience or engineering reviews demonstrate a design inadequacy.

4. Documentation required by NRC requirements such as 10 CFR 50.49 is not available or deficient.

2.5 Full Qualification

Full qualification constitutes conforming to all aspects of the current licensing basis, including codes and standards, design criteria, and commitments.

3.0 STANDARD TECHNICAL SPECIFICATIONS OPERABILITY DEFINITION AND DISCUSSION

3.1 Operability Definition

The Standard Technical Specifications (STS) define operable or operability as follows:

> "A system, subsystem, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified functions, and when all necessary attendant instrumentation, controls, electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its function(s) are also capable of performing their related support function(s)."

3.2 Variations of Operability Definition in Plant Specific TS

There are several variations in existing plant specific TS of the above basic definition. Therefore, some judgement is required in application of this guidance on operability. Word differences that exist are not viewed by the NRC to imply any significant overall difference in application of the plant specific TS. Any problems that result from existing inconsistencies between a plant specific definition of operability and this guidance should be discussed with regional management, who should discuss the issues with NRR if deemed necessary. In all cases, a licensee's plant-specific definition is governing.

3.3 Specified Function(s)

The definition of operability refers to capability to perform the "specified functions." The specified function(s) of the system, subsystem, train, component, or device (hereafter referred to as system) is that specified safety function(s) in the current licensing basis for the facility.

In addition to providing the specified safety function, a system is expected to perform as designed, tested and maintained. When system capability is degraded to a point where it cannot perform with reasonable assurance or reliability, the system should be judged inoperable, even if at this instantaneous point in time the system could provide the specified safety function. See Section 6.11, which discusses ASME Section XI, for an example.

3.4 Support System Operability - Understanding System Interrelationships

The definition of operability embodies a principle that a system can perform its specified safety function(s) only when all its necessary support systems are capable of performing their related support

functions. Therefore, an NRC inspector should expect that each licensee understands which support systems are necessary to ensure the operability of main systems and components that perform specified safety functions. Such an understanding is mandatory. Otherwise the licensee will not be able to implement the definition of operability.

4.0 BACKGROUND

The purpose of the Technical Specifications is to ensure that the plant is operated within its design basis and to preserve the validity of the safety analyses, which are concerned with both the prevention and mitigation of accidents. Because both prevention of accidents and the ability to mitigate them must be continuously ensured, the process of ensuring OPERABILITY for safety or safety support systems is ongoing and continuous. The focus of operability is foremost on the capability to ensure safety.

The process of ensuring operability is continuous and consists of the verification of operability by surveillances and formal determinations of operability whenever a verification or other indication calls into question the system's or component's ability to perform its specified function.

Verification of operability is supplemented by continuous and ongoing processes such as:

- Day-to-day operation of the facility
- Implementation of programs such as inservice testing and inspection
- Plant walkdowns or tours
- Observations from the control room
- Quality assurance activities such as audits and reviews
- Engineering design reviews including design basis reconstitution.

Without any information to the contrary, once a component or system is established as operable, it is reasonable to assume that the component or system should continue to remain operable, and the previously stated verifications should provide that assurance. However, whenever the ability of a system or structure to perform its specified function is called into question, operability must be determined from a detailed examination of the deficiency.

The determination of operability for systems is to be made promptly, with a timeliness that is commensurate with the potential safety significance of the issue. If the licensee chooses initially not to declare a system inoperable, the licensee must have a reasonable expectation that the system is operable and that the prompt determination process will support that expectation. Otherwise, the licensee should immediately declare the system or structure inoperable. Where there is reason to suspect that the determination process is not, or was not prompt, the Region may discuss with the licensee, with NRR consultation as appropriate, the reasoning for the perceived delay.

The TS establish operability requirements on systems required for safe operation and include surveillance requirements to demonstrate periodically that these systems are operable. Performance of the surveillance requirement is usually considered to be sufficient to demonstrate operability provided that there is reasonable assurance that the system continues to conform to all appropriate criteria in the current licensing basis (CLB). Whenever conformance to the appropriate criteria in the CLB is called into question, performance of the surveillance requirement alone is usually not sufficient to determine operability.

When operability verification or other processes indicate a potential deficiency or loss of quality, licensees should make a prompt determination of operability and act on the results of that determination. The licensee should also restore the quality of the system in accordance with 10 CFR Part 50, Appendix B, Criterion XVI, Corrective Action.

5.0 ADDITIONAL GUIDANCE FOR OPERABILITY DETERMINATIONS

In the course of review activities or through normal plant operation, a licensee may become aware of degraded or nonconforming conditions affecting the SSCs defined in Section 1. These activities include, but are not limited to, the following:

- Review of operational events
- Design modifications to facilities
- Examinations of records
- Additions to facilities
- Vendor reviews or inspections
- Plant system walkdowns.

These and other paths for identifying degraded or nonconforming conditions, including reports from industry and other utilities, should result in the prompt identification and correction of the deficiency by the licensee. Licensees should make an operability determination and take follow-on corrective action in the following circumstances:

- Discovery of degraded conditions of equipment where performance is called into question

- Discovery of nonconforming conditions where the qualification of equipment (such as conformance to codes and standards) is called into question

- Discovery of an existing but previously unanalyzed condition or accident. NOTE: For a previously unanalyzed condition or accident that is considered a significant safety concern, but is not part of the design basis, the licensee may subsequently be required to take additional action after consideration of backfit issues (See 10 CFR 50.109 (a)(5)).

The following guidance for dealing with issues that are closely associated with operability determinations has been derived from the NRC regulations and from previous guidance issued to licensees.

5.1 Focus on Safety

The immediate and primary attention must be directed to safety concerns. Reporting and procedural requirements should not interfere with ensuring the health and safety of the public. To continue operation while an operability determination is being made, the licensee must have a reasonable expectation that the system is operable and that the determination process will support that expectation.

5.2 Full Qualification

Full qualification constitutes conforming to all aspects of the current licensing basis, including codes and standards, design criteria, and commitments.

The SSCs defined in section 1 are designed and operated, as described in the current licensing basis (CLB), to include design margins and engineering margins of safety to ensure, among other things, that some loss of quality does not mean immediate failure. The CLB includes commitments to specific codes and standards, design criteria, and some regulations that also dictate margins. Many licensees add conservatism so that a partial loss of quality does not affect their commitments to the margins. The loss of conservatism not taken credit for in the safety analyses and not committed to by the licensee to satisfy licensing requirements does not require a system to be declared inoperable. All other losses of quality or margins are subject to an operability determination and corrective action.

5.3 Deal with Operability and Restoration of Qualification Separately

Operability and qualification are closely related concepts. However, the fact that a system is not fully qualified does not, in all cases, render that system unable to perform its specified function if called upon. According to the definition of operability, a safety or safety support system or structure must be capable of performing its specified function(s) of prevention or mitigation as described in the current licensing basis, particularly the TS bases or FSAR.

The prompt determination of operability will result in decisions or actions pertaining to continued plant operation, while qualification or requalification becomes a corrective action goal. Qualification concerns, whether it is a lack of required quality or loss of quality because of degradation, can and should be promptly considered to determine the effect of the concern on the operability of the system.

If operability is assured based on this prompt determination, plant operation can continue while an appropriate corrective action

program is implemented to restore full qualification. This is consistent with the plant TS being the controlling document for making decisions about plant operations, while 10 CFR Part 50, Appendix B, Criterion XVI, Corrective Action, is the requirement document for dealing with restoring equipment qualification.

The principle of treating the related concepts of operability and restoration of qualification separately is to ensure that the operability determination is focused on safety and is not delayed by decisions or actions necessary to plan or implement the corrective action, i.e., restoring full qualification.

5.4 Determining Operability and Plant Safety is a Continuous Decision-Making Process

Licensees are obligated to ensure the continued operability of SSCs as specified by TS, or to take the remedial actions addressed in the TS. For other SSCs which may be in a degraded or nonconforming condition, it must be determined whether a condition adverse to quality exists and whether corrective actions are needed. Operability is verified, as discussed above, by day-to-day operation, plant tours, observations from the control room, surveillances, test programs, and other similar activities. Deficiencies in the design basis or safety analysis or problems identified by the operability verification lead to the operability determination process by which the specific deficiency and overall capability of the component or system are examined. The process, in one form or another, is ongoing and continuous. As a practical matter, decision making requires good information and takes time. However, the process used by licensees should call for prompt and continuous attention to deficiencies and potential system inoperabilities. In addition, the licensee's process should call for immediately declaring equipment inoperable when reasonable expectation of operability does not exist or mounting evidence suggests that the final analysis will conclude that the equipment cannot perform its specified safety function(s).

5.5 Timeliness of Operability Determinations

Timeliness of operability determinations should be commensurate with the safety significance of the issue. Once the deficiency has been identified and the specific component or system has been identified, the determination can be made regarding the capability to perform the specified function(s). There is not an explicit requirement in the regulations for the timing of the decision. As discussed further in Section 6.0, timeliness is important and is determined by the safety significance of the issue. The Allowed Outage Times (AOTs) contained in TS generally provide reasonable guidelines for safety significance.

5.6 Timeliness of Corrective Action

Timeliness of corrective action (i.e., the requirements in 10 CFR Part 50, Appendix B, Criterion XVI, for "prompt" corrective action) should be commensurate with the safety significance of the corrective action.

The determination of operability establishes a basis for plant operation while the corrective action establishes or re-establishes the design basis/qualification of the safety or safety support system. As in Section 5.5 above, there is no explicit requirement in the regulations for timeliness of these corrective actions, except that 10 CFR Part 50, Appendix B, Criterion XVI requires it to be "prompt". Again, timeliness is determined by the safety significance of the issue.

5.7 Justification for Continued Operation

See the NRC Inspection Manual, Part 9900, Technical Guidance, "Resolution of Degraded and Nonconforming Conditions," for guidance on JCOs.

6.0 DETAILED DISCUSSION OF SPECIFIC OPERABILITY ISSUES

6.1 Scope and Timing of Operability Determinations

Determining system, structure, or component (SSC) operability is a continuous process that cannot be avoided. Action is required any time an SSC that is required by TS or NRC requirement to be operable is found to be inoperable. If an immediate threat to public health and safety is identified, action to place the plant in a safe condition should begin as soon as this circumstance is known and should be completed expeditiously.

Once a degraded or nonconforming condition of specific SSCs is identified, an operability determination should be made as soon as possible consistent with the safety importance of the SSC affected. In most cases, it is expected that the decision can be made immediately (e.g., loss of motive power, etc.). In other cases it is expected the decision can be made within approximately 24 hours of discovery even though complete information may not be available. Some few exceptional cases may take longer. For SSCs in TS, the Allowed Outage Times (AOTs) contained in TS generally provide reasonable guidelines for safety significance. For SSCs outside TS, engineering judgement must be used to determine safety significance. The decision should be based on the best information available and must be predicated on the licensee's reasonable expectation that the SSC is operable and that the prompt determination process will support that expectation. When reasonable expectation does not exist, the SSC should be declared inoperable and the safe course of action should be taken.

The licensee should examine the full scope of the current licensing basis, including the TS and FSAR commitments, to establish the conditions and performance requirements to be met for determining operability. The operability decision may be based on analysis, a test or partial test, experience with operating events, engineering judgment, or a combination of these factors taking into consideration equipment functional requirements. An initial determination regarding operability should be revised, as appropriate, as new or additional information becomes available.

The scope of an operability determination needs to be sufficient to address the capability of the equipment to perform its safety function(s). Operability determinations should therefore include the following actions:

- Determine what equipment is degraded or potentially nonconforming.
- Determine the safety function(s) performed by the equipment.
- Determine the circumstances of the potential nonconformance, including the possible failure mechanism.
- Determine the requirement or commitment established for the equipment, and why the requirement or commitment may not be met.
- Determine by what means and when the potentially nonconforming equipment was first discovered.
- Determine safest plant configuration including the effect of transitional action.
- Determine the basis for declaring the affected system operable, through:
  a. analysis
  b. test or partial test,
  c. operating experience, and
  d. engineering judgement.

If an NRC-approved action (such as provided in an LCO action statement) is immediately taken to compensate for failed equipment (e.g., placing one channel of reactor protection in the tripped condition upon failure of the channel such that the specified safety function can be maintained), continued operation of the facility is permitted.

However, continued operation with an inoperable channel in the tripped condition is not advisable because a subsequent failure will result in a plant trip that will challenge plant safety systems. It is also not advisable from the standpoint of plant availability.

6.2 Treatment of Single Failures in Operability Determinations

6.2.1 Definition of Single Failure

10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," defines a single failure as:

> "A single failure means an occurrence which results in the loss of capability of a component to perform its intended safety functions. Multiple failures resulting from a single occurrence are considered to be a single failure."

6.2.2 Capability to Withstand a Single Failure is a Design Consideration

Appendix A contains general design criteria (GDC) for SSCs that perform major safety functions. Many of the GDC contain a statement similar to the following:

> "Suitable redundancy in components and features and suitable interconnections, leak detection, isolation and containment capabilities shall be provided to assure that for onsite electrical power system operation (assuming offsite power in not available) and for offsite electrical power system operation (assuming onsite power is not available) the system safety function can be accomplished assuming a single failure."

See, for example, GDC 17, 34, 35, 38, 41, 44. Therefore, capability to withstand a single failure in fluid or electrical systems is a plant-specific design consideration, which ensures that a single failure does not result in a loss of the capability of the system to perform its safety functions.

6.2.3 Discovery of a Design Deficiency in Which Capability to Withstand a Single Failure is Lost

A design deficiency in which capability to withstand a single failure is lost, should be evaluated and treated as a degraded and nonconforming condition. As with any degraded or nonconforming condition, a prompt determination of operability is required.

For any design deficiency in which the capability to withstand a single failure is lost, the licensee must address the quality aspects and if the design deficiency affects the design basis requirements for the particular plant, promptly correct the deficiency in accordance with 10 CFR Part 50, Appendix B, Criterion XVI, Corrective Action.

6.3 Treatment of Consequential Failures in Operability Determinations

6.3.1 Definition of Consequential Failure

A consequential failure is a failure of an SSC caused by a postulated accident within the design basis. For example, if during a loss of coolant accident (LOCA) (a design basis event), the broken pipe could whip and incapacitate a nearby pump, then the pump would not be able to function. Such a pump failure is called a consequential failure because the pump failed as a result of the design basis event itself. In general, facility design takes any such consequential failures that are deemed credible into consideration. In this case, that would mean that the broken pump was not one that the safety analysis would take credit for to mitigate the LOCA.

6.3.2 Consequential Failures and Operability Determinations

Operability determinations should be performed for those potential consequential failures (i.e., an SSC failure that would be a direct consequence of a design basis event) for which the SSC in question needs to function. Where consequential failures would cause a loss of function needed for limiting or mitigating the effects of the event, the affected SSC is inoperable because it cannot perform all of its specified functions. Such situations are most likely discovered during design basis reconstitution studies, or when new credible failure modes are identified.

6.3.3 Consequential Failures and Appendix B

With any consequential failure, the licensee must address the quality aspects and if the failure affects the design basis requirements for the particular plant, promptly correct the deficiency in accordance with 10 CFR Part 50, Appendix B, Criterion XVI, Corrective Action.

6.4 Operability During TS Surveillances and Preventive Maintenance

During preventive maintenance (PM), equipment may be removed from service and rendered incapable of performing the function(s) specified for safety. This equipment is clearly inoperable. For equipment subject to the Technical Specifications (TS), the PM activity and any other action that may be required by the Limiting Conditions for Operation (LCOs), is expected to be completed within the Allowed Outage Time (AOT). For safety equipment not subject to the TS either explicitly by direct inclusion in the TS or implicitly through the definition of operability, the licensee's PM activities should be consistent with the importance of the equipment to safety and the function(s) of the equipment and a reasonable time goal should be set to complete the PM.

In all cases, care should be exercised in removing equipment from service for PM to avoid accumulating long out-of-service times of safety trains. The licensee should reestablish operability before the equipment is returned to service. The licensee also may need to reestablish operability for systems or components, in whole or in part, that are actively dependent upon the equipment undergoing the PM activity. The need for testing to reestablish operability should be based on a reasonable judgement about how the inoperable equipment may have been affected. If retesting to reestablish operability is not possible or practicable because of safety concerns, analysis or other means should be used to demonstrate operability.

If TS surveillances require that safety equipment be removed from service and rendered incapable of performing its safety function, the equipment is inoperable. The LCO action statement shall be entered unless the TS explicitly direct otherwise. Upon completion of the surveillance, the licensee should verify restoration to operable status of at least those portions of the equipment or system features that were altered to accomplish the surveillance.

NOTE: With regard to surveillances or other similar activities (such as inservice testing) that render systems

inoperable for extended periods (i.e., those that may exceed the Allowed Outage Time (AOT)), licensees must have prior NRC approval by license amendment for the surveillance requirement or redefine the tests. It is not the intent of surveillances or other similar program requirements to cause unwarranted plant shutdowns or to unnecessarily challenge other safety systems.

See "Maintenance - Voluntary Entry into Limiting Conditions for Operation Action Statements to Perform Preventive Maintenance," NRC Inspection Manual, Part 9900, Technical Guidance.

6.5 Surveillance and Operability Testing in Safety Configuration

Many systems are designed to perform both normal operational and safety functions. It is preferable that both the Technical Specification (TS) surveillance requirement testing and any other operability testing be performed in the same configuration as would be required to perform the safety function, i.e., safety mode. However, testing in the normal configuration or mode of operation may be required for systems if testing in the safety mode will result in unwarranted safety concerns or transients. The mode of operation for the TS surveillance requirements test is usually prescribed and the acceptance criteria are established on that basis.

If a system should fail while it is being tested in the safety mode of operation, the system is to be declared inoperable. For ongoing periodic testing that must
be performed during normal mode operation, the licensee should establish normal mode operational acceptance criteria that are based on a direct relationship to the safety mode requirements. Operability verification is then provided by acceptable normal mode operational test results.

Test failures should be examined to determine the root cause and correct the problem before resumption of testing. Repetitive testing to achieve acceptable test results without identifying the root cause or correction of any problem in a previous test is not acceptable as a means to establish or verify operability.

6.6 Missed Technical Specification Surveillance

The Standard Technical Specifications (STS) contain Surveillance Requirement 4.0.3 which states:

> "Failure to perform a Surveillance Requirement within the specified time interval shall constitute a failure to meet the OPERABILITY requirements for a Limiting Condition for Operation. Exceptions to these requirements are stated in the individual specifications. Surveillance Requirements do not have to be performed on inoperable equipment."

Plant-specific Technical Specification (TS) variations of this statement may exist, in which case the plant-specific TS govern.

The Allowed Outage Time (AOT) in the action requirements specifies a time interval that permits corrective action to be taken to satisfy the LCO. If such a time interval is specified in the action requirements or if the licensee has adopted by license amendment, the 24-hour provision of amended Surveillance Requirement 4.0.3 as discussed in Generic Letter (GL) 87-09, the completion of a missed surveillance within these time intervals meets the requirements. As with systems discovered to be inoperable, the time interval begins upon discovery of the missed surveillance. Failure to perform a TS requirement within the specified time interval is considered a condition prohibited by the TS and is reportable at least under 10 CFR Part 50.73; it also may be subject to enforcement action.

Generic Letter 87-09 and other documents provide extensive guidance on surveillance extension, applicability, and success criteria. The above discussion involves only the operability issues.

6.7 Use of Manual Action in Place of Automatic Action

Automatic action is frequently provided as a design feature specific to each safety system to ensure that the specified functions of the system will be accomplished. Limiting safety system settings for nuclear reactors are defined in 10 CFR Part 50.36, "Technical Specifications," as settings for automatic protective devices related to those variables having significant safety functions. Where a limiting safety system setting is specified for a variable on which a safety limit has been placed, the setting must be so chosen that automatic protective action will correct the abnormal situation before a safety limit is exceeded. Accordingly, it is not appropriate to take credit for manual
action in place of automatic action for protection of safety limits to consider equipment operable. This does not preclude operator action to put the plant in a safe condition, but operator action cannot be a substitute for automatic safety limit protection.

The licensing of specific plant designs includes consideration of automatic and manual action. While approvals have been granted for either or both type actions, not every combination of circumstances has been reviewed from an operability standpoint. Although it is possible, it is not expected that many determinations of operability will be successful for manual action in place of automatic action. Credit for manual initiation to mitigate the consequences of design basis accidents should have been established as part of the licensing review of a plant.

For any other situation in which substitution of manual action for automatic action may be acceptable, the licensee's determination of operability with regard to the use of manual action must focus on the physical differences between automatic and manual action and the ability of the manual action to accomplish the specified function. The physical differences to be considered include, but are not limited to, the ability to recognize input signals for action, ready access to or recognition of setpoints, design nuances that may complicate subsequent manual operation such as auto-reset, repositioning on temperature or pressure, timing required for

automatic action, etc., minimum manning requirements, and emergency operation procedures written for the automatic mode of operation. The licensee should have written procedures in place and training accomplished on those procedures before substitution of any manual action for the loss of an automatic action.

The assignment of a dedicated operator for manual action is not acceptable without written procedures and a full consideration of all pertinent differences. The consideration of manual action in remote areas also must include the ability and timing in getting to the area, training of personnel to accomplish the task, and occupational hazards to be incurred such as radiation, temperature, chemical, sound, or visibility hazards. One reasonable test of the reliability and effectiveness of manual action may be the approval of manual action for the same function at a similar plant. Nevertheless, this is expected to be a temporary condition until the automatic action can be promptly corrected in accordance with 10 CFR Part 50, Appendix B, Criterion XVI, Corrective Action.

6.8 "Indeterminate" State of Operability

An SSC is operable when it is capable of performing its specified function(s) and when all necessary support SSCs are also capable of performing their related support functions. See operability definition and discussion in Section 3.0. Otherwise, the SSC is inoperable. When a licensee has cause to question the operability of an SSC, the operability determination is to be prompt; the timeliness must be commensurate with the potential safety significance of the issue. The determination process during this time; however, must be predicated on the licensee's reasonable expectation that the SSC is operable and that the prompt determination process will support that expectation.

In the absence of reasonable expectation that the SSC is operable, the SSC is to be declared inoperable immediately. Subsequent evaluation may conclude that an SSC declared inoperable is in fact operable. The licensee's actions subsequent to declaring an SSC inoperable are guided by the regulations, TS, plant procedures, and so forth. In addition, the licensee should determine when and under what circumstances the system became inoperable so that reporting requirements may be met and NRC followup actions may properly reflect the circumstances and the licensee's efforts to correct and prevent recurrences. In summary, an SSC is either operable or inoperable at all time. "Indeterminate" is not a recognized state of operability.

6.9 Use of Probabilistic Risk Assessment in Operability Decisions

Probabilistic risk assessment (PRA) is a valuable tool for the relative evaluation of accident scenarios while considering, among other things, the probabilities of occurrence of accidents or external events. The definition of operability states; however, that the SSC must be capable of performing its specified function(s). The inherent assumption is that the occurrence conditions or event exists and that the safety function can be

performed. The use of PRA or probabilities of the occurrence of accidents or external events is not acceptable for making operability decisions.

However, PRA may provide valid and useful supportive information for a licensee amendment. The PRA is also useful for determining the safety significance of SSCs. The safety significance, whether determined by PRA or other analyses, is a necessary factor in decisions on the appropriate "timeliness" of operability determinations. Specific guidance on the timeliness of determinations is presented in Section 5.5.

6.10 Environmental Qualification

When the NRC or licensee identifies a potential deficiency in the environmental qualification of equipment (i.e., a licensee does not have an adequate basis to establish qualification), the licensee is expected to make a prompt determination of operability, to take immediate steps to establish a plan with a reasonable schedule to correct the deficiency, and to write a Justification for Continued Operation (JCO) (See Note below), which will be available for NRC review. The licensee may be able to make a finding of operability using analysis and partial test data to provide reasonable assurance that the equipment will perform its safety function(s) in its accident environment when called upon to do so. The licensee should also show that subsequent failure of the equipment will not result in significant degradation of any safety function or provide misleading information to the operator.

NOTE: The JCO referred to in questions of equipment qualification is specifically addressed by Generic Letter 88-07 dated April 7, 1988. This environmental qualification "JCO" includes an operability determination. It also states that the licensee should evaluate whether the findings are reportable under 10 CFR 50.72, 10 CFR 50.73, 10 CFR Part 21, the Technical Specifications, or any other pertinent reporting requirements, including 10 CFR 50.9.

The following actions should be taken if a licensee is unable to demonstrate equipment operability:

- For inoperable equipment in a system subject to the TS, the licensee shall follow the appropriate action statements. This could require that the plant be shut down or remain shut down.

- For inoperable equipment in a system not subject to the TS, the licensee may continue reactor operation if the safety function can be accomplished by other designated equipment that is qualified, or if limited administrative controls can be used to ensure the safety function is performed.

6.11 Technical Specification Operability vs. ASME Code, Section XI Operative Criteria

The Technical Specifications (TS) normally apply to overall system performance but sometimes contain limiting values for certain component performance, which are specified to ensure that the design basis and safety analysis is satisfied. The values (e.g., pump flow rate, valve closure time, valve leakage rate, safety/relief valve set point pressure) are operability verification criteria. If these values are not met at any time, the applicable LCO shall be entered.

The ASME Section XI inservice testing plans required under 10 CFR 50.55(a) for pumps and valves may contain the same or different limits and additional component performance acceptance values which, if not met, will indicate that the pump or valve has seriously degraded so that corrective action would be required to ensure or restore the operability and operational readiness of the pump or valve. The ASME Section XI acceptance criteria include "required action ranges" or limiting values for certain component performance parameters. These required action ranges or limiting values as defined by the code as component performance parameters, may be less conservative than the TS values which are safety analysis limits. However, action must be taken when the TS requirements are not met.

Generic Letter 89-04 Attachment 1, Position 8, defines the starting point for the Allowed Outage Time (AOT) in TS action statements for ASME Section XI pumps and valves. When performance data fall in the required action range, regardless of whether the limit is equal to or more conservative than the TS limit, the pump or valve must be declared inoperable immediately (the term "inoperative" is used in the text of ASME Section XI; the pump or valve is both "inoperative" and inoperable) and the TS action statement for the associated system must be entered.

In cases where the required action range limit is more conservative than its corresponding TS limit, the corrective action may not be limited to replacement or repair; it may be an analysis to demonstrate that the specific performance degradation does not impair operability and that the pump or valve will still fulfill its function, such as delivering the required flow. A new required action range may be established after such analysis which would then allow a new determination of operability.

The durations specified by the Code for analyzing test results have not been accepted by the NRC for postponing entering a TS action statement. As soon as data are recognized as being within the required action range for pumps or as exceeding the limiting value of full-stroke time for valves, the associated component must be declared inoperable and, if subject to the TS, the AOT specified in the action statement must be started at the time the component was declared inoperable. For inoperable pumps and valves considered by ASME Section XI but not subject to the TS, the action should be consistent with the safety significance of the issue and the functions served by the affected system(s).

Recalibrating test instruments and then repeating pump or valve tests is an acceptable alternative to the corrective action of repair or replacement, but is not an action that can be taken before declaring the pump or valve inoperable. However, if during a test it is obvious that a test instrument is malfunctioning, the test may be halted and the instruments promptly recalibrated or replaced. During a test, anomalous data with no clear indication of the cause must be attributed to the pump or valve under test. For this occurrence, a prompt determination of operability is appropriate with follow-on corrective action as necessary.

Note: In the above discussion, "required action range" and "inoperative" are ASME Section XI terms.

6.12 Support System Operability

The definition of operability embodies the principle that a system can perform its function(s) only if all necessary support systems are capable of performing their related support functions. It is incumbent upon each licensee to understand which support systems are necessary to ensure operability of systems and components that perform specified safety functions.

When a support system is determined to be inoperable, all systems for which that support system is required for systems operability should be declared inoperable and the LCOs for those systems entered. Any appropriate remedial actions specified by a supported system LCO action statement (to compensate for the inoperable supported system) should be taken.

When a support system is determined to be inoperable, the licensee should employ the same operability determination process for the supported systems, as the licensee would for any other degraded system. In particular, the scope and timing of such operability decisions should follow the guidance in Section 6.1.

There are cases where judgment on the part of a licensee is appropriate in determining whether a support system is or is not required. One example is the case of a ventilation system. A ventilation system may be required to ensure that other safety-related equipment can perform its safety function in the summer, but may not be required in the winter. Similarly, the electrical power supply for heat tracing may be required in the winter to ensure that a safety-related system equipment can perform its safety function, but may not be required in the summer. The need for judgment in reviewing what individual licensees do in specific cases should be recognized. If a licensee determines that a Technical Specification (TS) system ts capable of performing its specified function(s) with an inoperable support system that is not in the TS, then no additional action outside of restoring the inoperable support systems is needed. Furthermore, the licensee may modify the support function like any other change to the facility by use of the 10 CFR 50.59 process and FSAR update.

For some support systems, there are specific Allowed Outage Times (AOTs) specified in the TS. Ideally, the AOT contained in the TS

for a support system should be equal to or less than the AOT for any system for which that support system is required for system operability. Problems where inconsistencies exist between an AOT for a support system and the AOT for a system for which that support system is required should be discussed with regional management who should discuss the issue with NRR if deemed necessary. While such inconsistencies are being resolved, the more restrictive AOT should be used. In some cases an amendment to the TS may be necessary.

In all cases, the following principles should be used:

a. The most important safety concern is to ensure that the capability to perform a specified safety function is not lost as a result of more than one train of a support or supported system being declared inoperable. When a support or supported system is declared inoperable in one train, the corresponding independent support or supported systems and all other associated support systems in the opposite train(s) should be ensured to be operable; i.e., the complete capability to perform the specified safety function has not been lost. The term "ensure" as used here, allows for an administrative check by examining logs or other information to determine if required features are out-of-service for maintenance or other reasons. These actions are not to be used in lieu of required TS actions.

b. Upon determining that a loss of functional capability condition exists, actions specified in the support and supported system LCOs should be taken to mitigate the loss of functional capability.

6.13 Piping and Pipe Support Requirements

All piping and pipe supports found to be degraded or nonconforming should be subjected to an operability determination. To assist licensees in the determinations, operability guidance has been provided specific to various components. These components include the piping, supports, support plates, and anchor bolts. IE Bulletin No. 79-14 addressed the seismic analysis for as-build safety-related piping systems. The supplement to IE Bulletin 79-14 dated August 15, 1979 and Supplement 2 to IE Bulletin 79-14 dated September 7, 1979 provide additional guidance. Concrete anchor bolts and pipe supports are addressed with specific operability criteria in Supplement 1 to Revision 1 of IE Bulletin 79-02. The criteria for evaluating operability of seismic design piping supports and anchor bolts relating to Bulletins 79-02 and 79-14 are detailed in the E. Jordan memo to the Regions dated July 1979, and the V. Noonan memo dated August 7, 1979. Upon discovery of a nonconformance with piping and pipe supports, licensees may use the criteria in Appendix F of Section III of the ASME Code for operability determinations. These criteria and use of Appendix F are valid until the next refueling outage when the support(s) are to be restored to the FSAR criteria.

For systems determined to be otherwise operable but which do not meet the above criteria, licensees should treat the systems or

components as if inoperable until NRC approval is obtained for any additional criteria or evaluation methods used to determine operability. Where a piping support is determined to be inoperable, a determination of operability should be performed on the associated piping system.

6.14 Flaw Evaluation

Regulation 10 CFR 50.55a(g) and Standard Technical Specification (STS) 3.4.10 (the section number may vary with plant specific TS) require that the structural integrity of ASME Code Class 1, 2, and 3 components be maintained according to Section XI of the ASME Code. In the conduct of inservice inspection, maintenance activities, or during plant operation, flaws in components will be discovered. The operability of such systems containing flaws may depend on the flaw characterization or evaluation performed by the licensee and the acceptability of continued service of the component. Since the characterization and/or evaluation is vital to the determination of operability, the licensee's efforts following flaw detection must be prompt.

Components containing flaws characterized or determined to be within the acceptance standards in IWB-3500 (IC-3500 for Class 2 components) of Section XI are acceptable for continued service and, although no determination of operability is necessary, reporting must be in accordance with regulatory requirements.

Upon discovery of a flaw exceeding the acceptance standards in IWB-3500 (IWC-3500 for Class 2 components), the licensee should promptly determine operability. The evaluation and acceptance criteria of IWB-3600 may be used in the determination. For Class 3 moderate energy piping, i.e., Class 3 piping with a maximum operating temperature below 200 °F and a maximum operating pressure below 275 psig, the evaluation and acceptance criteria in Generic Letter 90-05 may be used.

The licensee may treat the system containing the flaw(s), evaluated and found to meet the acceptance criteria in IWB-3600, as operable until NRC approval in accordance with IWB-3600 is obtained. For Class 3 moderate energy piping, the licensee may treat the system containing the flaw(s), evaluated and found to meet the acceptance criteria in Generic Letter 90-05, as operable until relief is obtained from the NRC. The licensee must promptly submit its evaluation for either case to the NRC for review and approval.

Alternative evaluation procedures and/or acceptance criteria may also be used for flaws exceeding IWB-3600 or Generic Letter 90-05. When alternative evaluation procedures and/or acceptance criteria are used as a basis for acceptable continued service, the licensee must treat the system containing the flaw(s) as inoperable until NRC approval of procedures and criteria is obtained. Prior to the approval, the plant must be placed in a safe condition or for systems in the TS, the plant must enter the corresponding Limiting Condition for Operation.

6.15 Operational Leakage

If leakage develops in the reactor coolant system, there are additional requirements. The Technical Specifications (TS) do not permit any pressure boundary leakage. The Operational Leakage Limiting Condition for Operation (LCO) must be entered upon discovery of pressure boundary leakage; therefore, an operability determination is not appropriate.

Article NB-2121 of Section III of the ASME Code excludes code requirements from materials not associated with the pressure retaining function of a component, such as packing and gaskets. However, leakage from the reactor coolant system is limited to specified values in the TS depending on whether the leakage is from identified, unidentified, or specific sources such as the steam generator tubes or reactor coolant system pressure isolation valves. If the leakage exceeds the TS limits, the LCO must be entered.

For reactor coolant system leakage within the limits of the TS, the licensee should determine operability for the degraded component and include in the determination the effects of the leakage onto other components and materials.

Furthermore, the regulations and TS require that the structural integrity of ASME Code Class 1, 2, and 3 components be maintained according to Section XI of the ASME Code. If a leak is discovered in a Class 1, 2, or 3 component in the conduct of inservice inspections, maintenance activities, or during plant operation, IWA-5250 of Section XI requires corrective measures be taken based on repair or replacement in accordance with Section XI. In addition, a through-wall flaw does not meet the acceptance criteria in IWB-3600.

Upon discovery of leakage from a Class 1, 2, or 3 component pressure boundary (i.e., pipe wall, valve body, pump casing, etc.) the licensee should declare the component inoperable. The only exception is for Class 3 moderate energy piping as discussed in Generic Letter 90-05. For Class 3 moderate energy piping, the licensee may treat the system containing the through-wall flaw(s), evaluated and found to meet the acceptance criteria in Generic Letter 90-05, as operable until relief is obtained from the NRC.

6.16 Structural Requirements

Category I structures and supports (referred to herein as structures) which are subject to periodic surveillance and inspection in accordance with the requirements of Technical Specifications (TS) shall be considered operable if the limits stipulated in the TS are met. If these limits are not met, the Limiting Condition for Operations (LCOs) are to be entered for the affected structure.

If the degradation affects the ability of the structure to provide the required design support for systems attached to the structure, an operability determination must be performed for these systems as well.

Degradation affecting Category I structures include, for example, concrete cracking and spalling, excessive deflection or deformation, water leakage, rebar corrosion, missing or bent anchor bolts, etc. If these degradations are identified in Category I structures which are not subject to periodic surveillance and inspection, they should be assessed by the licensee to determine the capability of these structures to perform their specified function. As long as the identified degradation does not result in the exceedance of acceptance limits specified in applicable design codes and standards, referenced in the design basis document, the affected structures are operable.

Significant degradations resulting in the exceedance of the acceptance limits must be promptly reported in accordance with the requirements in 10 CFR 50.72 and evaluated by the licensee for determination of operability. These evaluations should include the criteria used for the operability determination and the rationale for continued plant operation in a degraded condition outside of the design basis. The licensee's evaluations should also include the plan for corrective action, as required by Criterion XVI of Appendix B to 10 CFR Part 50, to restore degraded structures to their original design requirements. As stated above, any system which depends upon the degraded structure for required support should also be examined for operability if the degradation or nonconformance calls into question the performance of the system. NRC inspectors, with possible support from headquarters, should review licensees' evaluations of structural degradations to determine their technical adequacy and conformance to licensing and regulatory requirements.

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